

WHAT IS CLAIMED IS:

1 1. A method for identifying protocol encapsulation in received
2 network data comprising providing a grammar and parsing incoming network data using
3 said grammar, said network data being organized into data packets.

1 2. The method of claim 1 wherein said grammar is a grammar graph,
2 the method further including providing a deterministic finite automaton (DFA)
3 representing said grammar graph

1 3. The method of claim 1 further including scanning said incoming
2 network data using lexical token scanning to produce plural lexical tokens, said step of
3 parsing including parsing said lexical tokens.

1 4. The method of claim 3 wherein said lexical scanning includes
2 providing a set of regular expressions.

1 5. The method of claim 3 further including providing a deterministic
2 finite automaton (DFA), said DFA including a representation of said lexical tokens and
3 said grammar, said step of scanning including recognizing lexical tokens contained in
4 said data packets using said DFA, said step of parsing including identifying grammatical
5 structure among said lexical tokens using said DFA to identify protocol encapsulation in
6 said incoming network data.

1 6. In a data packet network switching device, a method for processing
2 data packets comprising:
3 providing a grammar;
4 receiving plural data packets, each having a length not necessarily equal to
5 one another; and
6 for each data packet, lexically scanning said data packet to produce plural
7 lexical tokens, parsing said lexical tokens to produce one or more identified protocols,
8 and processing said data packet based on said identified protocols.

1 7. The method of claim 6 further including compiling said grammar
2 to produce a grammar graph.

1 8. The method of claim 7 wherein said lexical scanning includes
2 providing regular expressions for identifying said lexical tokens.

1 9. The method of claim 8 further including compiling said regular
2 expressions are into a deterministic finite automaton (DFA).

1 10. The method of claim 9 further including incorporating said
2 grammar graph into said DFA.

1 11. In a data packet receiving and forwarding device, a method for
2 processing data packets comprising a stream of data, said method comprising:
3 receiving a description of grammar rules in a grammar packet
4 classification language;
5 compiling said grammar packet classification language to produce a
6 grammar graph;
7 configuring a programmable grammatical packet classifier with said
8 grammar graph;
9 parsing said data stream with said grammatical packet classifier to identify
10 a protocol structure in a received data packet; and
11 processing said received data packet in accordance with said protocol
12 structure.

1 12. The method of claim 11 further including:
2 receiving a description of classification rules in a lexical classification
3 language;
4 compiling said classification language to produce a deterministic finite
5 automaton (DFA) comprising plural states;
6 configuring said hardware packet classifier with said DFA; and
7 scanning said data stream with said hardware packet classifier to produce
8 plural lexical tokens,
9 wherein said parsing is a step of parsing said lexical tokens.

1 13. The method of claim 12 wherein said grammar graph is
2 incorporated into said DFA.

1 14. The method of claim 12 wherein said lexical classification
2 language includes regular expressions.

1 15. The method of claim 14 wherein said regular expressions include
2 arithmetic and logic operations.

1 16. The method of claim 15 wherein said regular expressions further
2 include skip operations.

1 17. The method of claim 16 wherein said regular expressions further
2 include data storage operations.

1 18. A network data packet classifier comprising:
2 an input port for receiving network data packets comprising a stream of
3 data;
4 a memory assemblage configured with data representing a deterministic
5 finite automaton (DFA), said DFA representing a grammar graph and plural regular
6 expressions; and
7 decompression logic operatively coupled to said memory assemblage and
8 configured to scan said stream of data with said DFA to find a matching one of said
9 regular expressions thereby producing plural lexical tokens,
10 said decompression logic further configured to parse said lexical tokens
11 with said DFA to identify a protocol structure in a received network data packet,
12 wherein processing of said network data packet depends on said protocol
13 structure.

1 19. The classifier of claim 18 wherein some of said regular expressions
2 include arithmetic instructions and logic instructions, said memory assemblage further
3 configured to contain said instructions, the classifier further including an arithmetic logic
4 unit operatively coupled to said decompression logic and configured to execute said
5 instructions.

1 20. The classifier of claim 19 further including at least one register
2 operatively coupled to said arithmetic logic unit, said arithmetic logic unit further
3 configured to store data into said register in response to a save instruction.

1 21. The classifier of claim 19 further including skip logic operatively
2 coupled to said logic component and configured to skip over an amount of data in
3 response a skip instruction.

1 22. The classifier of claim 18 wherein said network data packets can
2 vary from one packet to another.

1 23. The classifier of claim 18 wherein said DFA is in compressed
2 form.

1 24. The classifier of claim 23 wherein said DFA comprises plural non-
2 default states and plural default states, and said memory assemblage comprises a base
3 memory, a next-state memory, and a default-state memory; said base memory configured
4 to contain address locations of said next-state memory, said next-state memory
5 representing all of said non-default states, said default-state memory representing all of
6 said default states.

1 25. The classifier of claim 24 wherein said memories are random
2 access memories.

1 26. The classifier of claim 24 wherein said memories are read-only
2 memories.

1 27. A network packet classifier comprising:
2 means for receiving an incoming network packet; and
3 means for identifying protocol structure in said network packet including
4 means for scanning to match patterns in its constituent data against plural regular
5 expressions to produce lexical tokens and means for parsing through said lexical tokens
6 using a grammar.

1 28. The classifier of claim 27 wherein said means for scanning
2 includes a memory component configured with data to represent a deterministic finite
3 automaton (DFA).

1 29. The classifier of claim 28 wherein said memory component is
2 further configured to include said grammar.

- 1 30. The classifier of claim 27 wherein said regular expressions include
2 arithmetic specifiers and said means for classifying includes an arithmetic logic unit
3 configured to perform operations in accordance with said arithmetic specifiers.

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